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General

Guideline Title

ACR Appropriateness Criteria® cranial neuropathy.

Bibliographic Source(s)

Wippold FJ II, Cornelius RS, Aiken AH, Angtuaco EJ, Berger KL, Brown DC, Davis PC, Holloway K, McConnell CT Jr, Mechtler LL, Nussenbaum B, Rosenow JM, Roth CJ, Seidenwurm DJ, Slavin K, Waxman AD, Expert Panel on Neurologic Imaging. ACR Appropriateness CriteriaÂ® cranial neuropathy. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 18 p. [130 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Wippold FJ II, Cornelius RS, Broderick DF, Brown DC, Brunberg JA, Davis PC, De La Paz RL, Garvin CF, Holloway K, McConnell CT Jr, Mukherji SK, Nussenbaum B, Rosenow JM, Seidenwurm DJ, Slavin K, Sloan MA, Smirniotopoulos JG, Expert Panel on Neurologic Imaging. ACR Appropriateness Criteria® cranial neuropathy. [online publication]. Reston (VA): American College of Radiology (ACR); 2009. 23 p.

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Cranial Neuropathy

Variant 1: Anosmia and abnormalities of the sense of smell.

Radiologic Procedure	Rating	Comments	RRL*
MRI head without and with contrast / Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate	8	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the anterior skull base and paranasal sinuses to include multiple planes and thin slices. Additional sequences and extended anatomic ranges may be necessary to identify extracranial disease. See statement regarding	O / *Relative Radiation Level

contrast in text under "Anticipated Exceptions."

Radiologic Procedure	Rating	Comments	RRL*
MRI head without contrast	7	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the anterior skull base and paranasal sinuses to include multiple planes and thin slices. Small olfactory groove lesions may be missed without use of intravenous contrast. Additional sequences and extended anatomic ranges may be necessary to identify extracranial disease.	O
CT head with contrast	6	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the anterior skull base and paranasal sinuses to include multiple planes and thin slices. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges may be necessary to identify extracranial disease.	
CT head without contrast	5	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the anterior skull base and paranasal sinuses to include multiple planes and thin slices. Small olfactory groove lesions may be missed without use of intravenous contrast. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges may be necessary to identify extracranial disease.	
CT head without and with contrast	3		
FDG-PET/CT whole body	1	Useful when MRI is equivocal or cannot be performed. Especially useful in patients with suspected or proven neoplastic process.	
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Weakness or paralysis of the muscles of mastication; sensory abnormalities of the head and neck.

Radiologic Procedure	Rating	Comments	RRL*
MRI head without and with contrast	9	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the cerebellopontine angle, central skull base, orbit, and masticator space to include multiple planes and thin slices. Additional sequences and extended anatomic ranges may be necessary to identify extracranial	O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Radiologic Procedure	Rating	Comments	RRL*
		disease. If facial pain is a clinical concern, high-resolution sequences such as CISS/FIESTA and magnetic resonance (MR) angiography may be useful in identifying vascular compression. See statement regarding contrast in text under "Anticipated Exceptions."	
MRI head without contrast	7	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the cerebellopontine angle, central skull base, orbit, and masticator space to include multiple planes and thin slices. Additional sequences and extended anatomic ranges may be necessary to identify extracranial disease. If facial pain is a clinical concern, high-resolution sequences such as CISS/FIESTA and MR angiography may be useful in identifying vascular compression. Inflammatory conditions and some tumors may be missed without use of intravenous contrast.	O
CT head with contrast	6	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the cerebellopontine angle, central skull base, orbit, and masticator space to include multiple planes and thin slices. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges may be necessary to identify extracranial disease.	
CT head without contrast	5	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the cerebellopontine angle, central skull base, orbit, and masticator space to include multiple planes and thin slices. Inflammatory conditions and some tumors may be missed without use of intravenous contrast. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges may be necessary to identify extracranial disease.	
CT head without and with contrast	3		
FDG-PET/CT whole body	1	Useful when MRI is equivocal or cannot be performed. Especially useful in patients with suspected or proven neoplastic process.	
US neck	1	May be useful as a problem-solving technique in evaluating extracranial disease following initial imaging evaluation.	O
<u>Rating Scale</u>: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation

Radiologic Procedure	Rating	Comments	Level RRL*

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Weakness or paralysis of facial expression.

Radiologic Procedure	Rating	Comments	RRL*
MRI head without and with contrast	9	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the central and posterior skull base, temporal bones, and parotid glands to include multiple planes and thin slices. Additional sequences and extended anatomic ranges may be necessary to identify extracranial disease. See statement regarding contrast in text under "Anticipated Exceptions."	O
MRI head without contrast	7	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the central and posterior skull base, temporal bones, and parotid glands to include multiple planes and thin slices. Small lesions and facial nerve pathology may be missed without use of intravenous contrast. Additional sequences and extended anatomic ranges may be necessary to identify extracranial disease.	O
CT head with contrast	6	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the central and posterior skull base, temporal bones, and parotid glands to include multiple planes and thin slices. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges may be necessary to identify extracranial disease.	
CT head without contrast	5	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the central and posterior skull base, temporal bones, and parotid glands to include multiple planes and thin slices. Small lesions and facial nerve pathology may be missed without use of intravenous contrast. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges may be necessary to identify extracranial disease.	
CT head without and with contrast	3		
FDG-PET/CT whole body	1	Useful when MRI is equivocal or cannot be performed. Especially useful in patients with suspected or proven neoplastic process.	

Radiologic Procedure	Rating	Comments	RRL*
US neck	1	May be useful as a problem-solving technique in evaluating extracranial disease following initial imaging evaluation.	O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 4: Palate weakness.

Radiologic Procedure	Rating	Comments	RRL*
MRI head without and with contrast	9	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Additional sequences and extended anatomic ranges to include the neck may be necessary to identify extracranial disease. See statement regarding contrast in text under "Anticipated Exceptions."	O
MRI head without contrast	7	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Small lesions and glossopharyngeal nerve pathology may be missed without use of intravenous contrast. Additional sequences and extended anatomic ranges to include the neck may be necessary to identify extracranial disease.	O
CT head with contrast	6	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges to include the neck may be necessary to identify extracranial disease.	
CT head without contrast	5	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Small lesions and glossopharyngeal nerve pathology may be missed without use of intravenous contrast. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges to include the neck may be necessary to identify extracranial disease.	
CT head without and with contrast	3		
FDG-PET/CT whole body	4	Useful when MRI is equivocal or cannot be performed. Especially useful in patients with suspected	
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation

or proven neoplastic process.

Radiologic Procedure	Rating	Comments	RRL*
US neck	1	May be useful as a problem-solving technique in evaluating extracranial disease following initial imaging evaluation.	O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 5: Vocal cord paralysis.

Radiologic Procedure	Rating	Comments	RRL*
MRI head and neck without and with contrast	8	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Additional sequences and extended anatomic ranges to include the neck from the skull base to the aortopulmonary window are necessary to identify extracranial disease. Alternatively, a chest CT with contrast may be substituted for the thoracic portion of the MRI. See statement regarding contrast in text under "Anticipated Exceptions."	O
CT head and neck with contrast	8	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges to include the neck from the skull base to the aortopulmonary window are necessary to identify extracranial disease. High-resolution images using a soft tissue algorithm may be useful in evaluating the larynx.	
MRI head and neck without contrast	7	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Small lesions and vagal nerve pathology may be missed without use of intravenous contrast. Additional sequences and extended anatomic ranges to include the neck from the skull base to the aortopulmonary window are necessary to identify extracranial disease. Alternatively, a chest CT with contrast may be substituted for the thoracic portion of the MRI.	O
CT chest with contrast	6	May be used as alternative to MRI of chest or supplement to MRI or CT of the head and neck to evaluate the intrathoracic course of the vagal nerve and to evaluate thoracic pathology.	
CT head and neck without contrast	5	In addition to survey images to evaluate possible	
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative

Radiologic Procedure	Rating	Comments	RRL*
		intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Small lesions and vagal nerve pathology may be missed without use of intravenous contrast. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges to include the neck from the skull base to the aortopulmonary window are necessary to identify extracranial disease. High-resolution images using a soft tissue algorithm may be useful in evaluating the larynx.	
CT head and neck without and with contrast	3		
CT chest without and with contrast	3		
CT chest without contrast	3		
X-ray chest	2	May be used as a screening tool if chest CT or chest MRI unavailable.	
FDG-PET/CT whole body	1	Useful when MRI is equivocal or cannot be performed. Especially useful in patients with suspected or proven neoplastic process.	
US neck	1	May be useful as a problem-solving technique in evaluating extracranial disease following initial imaging evaluation.	O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 6: Weakness or paralysis of the sternocleidomastoid and trapezius muscles.

Radiologic Procedure	Rating	Comments	RRL*
MRI head and neck without and with contrast	9	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Additional sequences and extended anatomic ranges to include the neck are necessary to identify extracranial disease. See statement regarding contrast in text under "Anticipated Exceptions."	O
MRI head and neck without contrast	7	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull	O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Radiologic Procedure	Rating	Comments	RRL*
		base to include multiple planes and thin slices. Small lesions and spinal accessory nerve pathology may be missed without use of intravenous contrast. Additional sequences and extended anatomic ranges to include the neck are necessary to identify extracranial disease.	
CT head and neck with contrast	6	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges to include the neck are necessary to identify extracranial disease.	
CT head and neck without contrast	5	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Small lesions and spinal accessory nerve pathology may be missed without use of intravenous contrast. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges to include the neck are necessary to identify extracranial disease.	
CT head and neck without and with contrast	3		
FDG-PET/CT whole body	1	Useful when MRI is equivocal or cannot be performed. Especially useful in patients with suspected or proven neoplastic process.	
US neck	1	May be useful as a problem-solving technique in evaluating extracranial disease following initial imaging evaluation.	O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 7: Weakness or paralysis of the tongue.

Radiologic Procedure	Rating	Comments	RRL*
MRI head without and with contrast	9	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Additional sequences and extended anatomic ranges to include the neck may be necessary to identify extracranial disease. See statement regarding contrast in text under "Anticipated Exceptions."	O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative

Radiologic Procedure	Rating	Comments	RRL*
MRI head without contrast	7	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Small lesions and hypoglossal nerve pathology may be missed without use of intravenous contrast. Additional sequences and extended anatomic ranges to include the neck may be necessary to identify extracranial disease.	O
CT head with contrast	6	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges to include the neck may be necessary to identify extracranial disease.	
CT head without contrast	5	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Small lesions and hypoglossal nerve pathology may be missed without use of intravenous contrast. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges to include the neck may be necessary to identify extracranial disease.	
CT head without and with contrast	3		
FDG-PET/CT whole body	1	Useful when MRI is equivocal or cannot be performed. Especially useful in patients with suspected or proven neoplastic process.	
US neck	1	May be useful as a problem-solving technique in evaluating extracranial disease following initial imaging evaluation.	O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 8: Perineural spread of tumor.

Radiologic Procedure	Rating	Comments	RRL*
MRI head and neck without and with contrast	9	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Additional sequences and extended anatomic ranges to	O

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate *Relative Radiation Level

Radiologic Procedure	Rating	Comments	RRL*
		include the neck may be necessary to identify extracranial disease. See statement regarding contrast in text under "Anticipated Exceptions."	
MRI head and neck without contrast	6	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Small lesions and nerve pathology may be missed without use of intravenous contrast. Additional sequences and extended anatomic ranges to include the neck may be necessary to identify extracranial disease.	O
CT head and neck with contrast	5	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges to include the neck may be necessary to identify extracranial disease.	
CT head and neck without contrast	4	In addition to survey images to evaluate possible intracranial disease, the scan should focus on the skull base to include multiple planes and thin slices. Small lesions and nerve pathology may be missed without use of intravenous contrast. High-resolution images using a bone algorithm may be useful in evaluating patients sustaining trauma and in evaluating the bony foramina and possible bone erosion. Extended anatomic ranges to include the neck may be necessary to identify extracranial disease.	
CT head and neck without and with contrast	3		
FDG-PET/CT whole body	1	Useful when MRI is equivocal or cannot be performed. Especially useful in patients with suspected or proven neoplastic process.	
US neck	1	May be useful as a problem-solving technique in evaluating extracranial disease following initial imaging evaluation.	O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

Nerves are bundles of axons in the peripheral nervous system that carry sensory (afferent) electrochemical impulses from the body to the brain and motor (efferent) impulses from the brain to the body. The cranial nerves arise from nuclei within the brain and brainstem and supply sensory and motor innervation to the head and neck region, whereas the spinal nerves arise from the spinal cord and supply the rest of the body. As a group, the cranial nerves have both sensory and motor components similar to those of the spinal nerves. Individually the cranial nerves may be purely sensory or purely motor or a mixture of both sensory and motor. Functions of the cranial nerves may be divided into three sensory and three motor categories. The sensory group includes visceral sensory, which supplies sensory input from the internal organs; general sensory, which supplies tactile, pain, temperature and other sensations; and special sensory, which includes the special senses of smell, vision, taste, hearing, and balance. Of the three motor functions, somatic motor innervates muscles that develop from the body somites; branchial motor innervates muscles derived from the branchial arches; and visceral motor innervates the viscera, glands, and smooth muscle.

Cranial nerves emerge in an orderly fashion from the rostral portion of the embryologically developing neural tube, which will subsequently mature to form the brain and brain stem. Anatomically, the 12 pairs of cranial nerves are designated by numbers and are organized most rostral to most caudal in descending order. The cranial nerves (CN) include the olfactory (CN I), optic (CN II), oculomotor (CN III), trochlear (CN IV), trigeminal (CN V), abducens (CN VI), facial (CN VII), vestibulocochlear (CN VIII), glossopharyngeal (CN IX), vagus (CN X), spinal accessory (CN XI), and hypoglossal (CN XII) nerves. The olfactory (CN I) and optic (CN II) nerves are actually tracts formed from the telencephalon and diencephalon, respectively, and are not considered true nerves. The optic (CN II), oculomotor (CN III), trochlear (CN IV), and abducens (CN VI) nerves are considered functionally to be part of the visual and extraocular motor system and have been discussed in the National Guideline Clearinghouse (NGC) summary ACR Appropriateness Criteria® orbits, vision and visual loss. Also, the vestibulocochlear nerve (CN VIII) has been reviewed in the NGC summary ACR Appropriateness Criteria® hearing loss and/or vertigo. Therefore, this discussion will focus on cranial nerves CN I, CN V, CN VII, CN IX, CN X, CN XI, and CN XII.

In approaching cranial neuropathy, several concepts should be emphasized:

1. Because of the complex anatomic structures within the brain and brainstem and because the cranial nerves may take long, circuitous routes to their destinations, a detailed knowledge of cranial nerve anatomy is essential for proper clinical localization of potential lesions and for appropriate application of specific imaging protocols.
2. Because some individual nerve fibers, such as the autonomic nerves, may travel with several different cranial nerves from their nuclei of origin to their ultimate destinations, loss of a specific function may indicate involvement of potentially more than one cranial nerve.
3. Because of the close proximity of many cranial nerve nuclei and of many exiting sites of the nerves themselves, some mass lesions may involve multiple cranial nerves.

Imaging Modalities

Magnetic resonance imaging (MRI) has emerged as the modality of choice when evaluating the cranial nerves; computed tomography (CT) remains useful for visualizing the skull base neural foramina, calcific matrices within lesions, and osseous erosions. In general, high-field-strength magnets (1.5T-3.0T) are preferred to low-field-strength units because of achievable signal-to-noise ratios, gradient strength, and spatial resolution. A phased-array head coil suffices for most examinations; specialized surface coils may supplement examinations of peripherally located nerves. The primary plane of study is usually the axial plane. Additional orthogonal planes may be useful, depending upon the course of the various nerves.

Fundamental techniques include T1-weighted, T2-weighted, and enhanced T1-weighted imaging sequences. The unenhanced T1-weighted sequence remains an excellent baseline technique for anatomical evaluation because of the natural contrast provided by soft tissue, cerebrospinal fluid, and skull base fat. Specialized versions of sequences may be available on scanners depending on manufacturer options. For example, various three-dimensional (3D) and heavily T2-weighted sequences — such as constructive interference in steady-state (CISS), 3D-balanced fast-field-echo (b-FFE), 3D-driven equilibrium radio frequency reset pulse (DRIVE), 3D fast-spin-echo (3D-FSE), fast imaging employing steady-state acquisition (FIESTA), and 3D-FSE extended echo-train acquisition (3D-FSE XETA) — may provide excellent spatial resolution of the cisternal segments of some of the cranial nerves, but they must be used judiciously because of potentially misleading artifacts. Enhanced fat suppression T1-weighted techniques may emphasize abnormal enhancing lesions and nerves, but may potentially mask subtle pathology if the suppression is nonuniform. Additional sequences, such as diffusion-weighted imaging (DWI), may be added to evaluate specific pathologies, such as infarctions, or specific lesions, such as epidermoids, which may affect cranial nerve function. Slice thickness should be calculated for optimal spatial resolution without introducing partial-volume effect. Because cranial nerve examinations tend to be lengthy, strategies such as parallel imaging may improve patient compliance and image quality.

Imaging protocol design should balance specificity and sensitivity. Patients referred with detailed history and physical examination information benefit from tightly focused imaging evaluations, whereas patients with little clinical evaluation prior to imaging and who are referred for so-called "screening" studies are best served with scans that cover all of the potentially affected regions of the head and neck. Protocols should focus on optimally demonstrating the anatomic territories associated with the cranial nerve or nerves in question. In general, the course of the entire nerve should be imaged.

Positron emission tomography (PET), when combined with CT as a PET/CT of the whole body, may be useful as a problem-solving technique following initial cross-sectional imaging in patients with a known primary malignancy. PET/CT may also be superior to cross-sectional imaging for both localization and determination of response to therapy. Ultrasound (US) of the neck may be useful for assessing lesions such as tumors or lymphadenopathy that have caused cranial neuropathy.

Anosmia and Abnormalities of the Sense of Smell

Abnormalities of the special sense of smell are mediated by the olfactory nerve (CN I) and can be grouped into clinical categories. Quantitative disturbances imply diminished or enhanced sense of smell (anosmia, hyposmia, or hyperosmia). Qualitative disturbances involve distortions of the sense of smell (dysosmia). Discrimination disturbances involve an inability to differentiate among various smells. Hallucinations or delusions in the sense of smell may also occur. The latter may be caused by temporal lobe dysfunction (see the NGC summary ACR Appropriateness Criteria® seizures and epilepsy), or by degenerative or psychiatric disease. Taste, mediated by the facial (CN VII) and glossopharyngeal (CN IX) nerves, may also be affected by pathology involving the olfactory nerve (CN I).

Most patients with olfactory complaints do not require imaging. Chronic tobacco use and upper respiratory infections most commonly affect the sense of smell. More serious conditions affecting the olfactory nerve include trauma (the olfactory nerve is the nerve most commonly disrupted by trauma); cribriform plate tumors such as invasive squamous cell carcinomas of the paranasal sinuses, meningiomas, and esthesioneuroblastomas; inflammatory lesions such as sarcoidosis and Wegener's granulomatosis; and congenital conditions such as cephaloceles and Kallmann's syndrome. Recent investigations have focused on olfactory bulb volume as an indicator of olfactory dysfunction and even a marker for such disorders as early Parkinson's disease and depression.

MRI is the mainstay for examining the olfactory apparatus, although CT remains useful when evaluating fractures, paranasal sinus inflammatory disease, and bony anatomy. Imaging protocols should cover the major anatomic divisions of the olfactory nerve and pathway, including the olfactory epithelium, which is located in the upper nasal cavity; the olfactory neurons and bulbs, located in the cribriform plate and inferior frontal lobes; and the olfactory pathways, which travel in portions of the temporal and frontal lobes. Efforts using functional MRI, single photon emission tomography (SPECT), and PET in studying olfactory dysfunction remain largely investigative and are not generally used in routine evaluations.

Weakness or Paralysis of the Muscles of Mastication; Sensory Abnormalities of the Head and Neck

The trigeminal nerve (CN V) provides general sensation to large portions of the head and neck and branchial motor innervation to the muscles of mastication. It is the largest cranial nerve and is divided into three main divisions known as the ophthalmic (V1), maxillary (V2), and mandibular (V3) branches. Symptoms largely depend on the involved segment and division. Abnormalities of the nerve may manifest as sensory disturbances, such as trigeminal neuralgia (*tic douloureux*) or facial numbness, or motor abnormalities such as weakness when chewing food.

The trigeminal nerve (CN V) is the nerve of the first branchial arch and may be involved in congenital conditions such as Goldenhar-Gorlin syndrome. Intra-axial and extra-axial processes may affect the brainstem trigeminal nuclei and nerve root entry and exit zones. Conditions localized to the brainstem portion of the trigeminal nerve (CN V) include vascular lesions (such as compressing vascular loops, aneurysms, and infarctions), inflammatory and infectious conditions (such as meningitis, encephalitis, sarcoidosis, and multiple sclerosis), and tumors (such as gliomas, lymphomas, metastases, and meningiomas). The cisternal portion of the nerve may be especially vulnerable to compression from adjacent vascular loops, causing trigeminal neuralgia. Tumors, vascular lesions, and inflammatory processes may also affect the branches of the nerve as they traverse Meckel's cave, the pterygopalatine fossa, the orbit, the skull base, and the masticator space.

MRI is the preferred modality for investigating the trigeminal nerve (CN V). CT is very useful for evaluating the skull base and neural foramina. Three-dimensional and heavily T2-weighted magnetic resonance (MR) sequences and MR and CT angiography are helpful noninvasive methods for reviewing the anatomy of potentially compressing vascular loops. With the growing popularity of radiosurgery, such as gamma knife procedures, and radiofrequency thermocoagulation in the treatment of trigeminal neuralgia, both CT and MRI have become indispensable planning and follow-up tools, although imaging may not reliably predict outcome. Because of the complex branching patterns of the nerve, multiple imaging planes are essential. Advanced imaging applications, such as fractional anisotropy derived from diffusion tensor imaging and virtual endoscopy, are promising future directions in investigating trigeminal neuralgia.

Weakness or Paralysis of Facial Expression

The facial nerve (CN VII) is one of the most complex cranial nerves and contains branchial motor (innervation to the muscles of facial expression), visceral motor (parasympathetic innervation to most of the glands of the head), general sensory (surface innervations to a small portion of the external ear and tympanic membrane), and special sensory (taste to the anterior two-thirds of the tongue) functions. It is the one of the most commonly paralyzed nerves in the body, and most of the clinical attention it receives focuses on its role in facial expression. Tinnitus, conductive and sensorineural hearing loss, and hemifacial spasm may also signal a lesion involving the facial nerve.

The intracranial course of the facial nerve includes pontine, cisternal, and intra-temporal segments. Within the pons, the facial nuclei can be affected by intra-axial conditions such as infarction, vascular malformations, tumors, and multiple sclerosis. As the nerve exits the brainstem and courses through the temporal bone, it may be affected by facial and vestibular schwannomas, meningiomas, vascular lesions, inflammation, cholesteatomas, paragangliomas, trauma, and intrinsic bone tumors. The extracranial segment of the facial nerve courses through the parotid gland and may be affected by parotid tumors and inflammation and conditions of the neighboring anatomic spaces and skull base such as carcinomas, sarcomas, trauma, and inflammatory disease.

MRI is the mainstay of evaluating both intracranial and extracranial portions of the facial nerve. CT provides useful information regarding temporal bone fractures and trauma, presurgical bony anatomy, nerve involvement with inflammatory middle ear disease, foraminal expansion, patterns of bone erosion, and intrinsic bone tumor matrices. Facial paralysis in the form of Bell's palsy is one of the most common syndromes confronting the otolaryngologist. In general, Bell's palsy patients need not be imaged unless the symptoms are atypical or persist for >2 months. When imaging is considered, MRI is the method of choice. Enhancement may be seen in the labyrinthine, geniculate, tympanic, and mastoid portions of the nerve in neuritis, although tympanic and mastoid portions may enhance normally. MRI may also be useful in establishing prognosis.

Palate Weakness

The glossopharyngeal nerve (CN IX) arises in the medulla and is responsible for branchial motor innervation to the stylopharyngeus muscle, which elevates the palate, and visceral motor parasympathetic innervation to the parotid gland. Visceral sensory innervation to the carotid sinus plays a role in regulating circulation and general and special sensory functions that supply sensation and taste to the posterior tongue. The nerve exits the jugular foramen in close proximity to the vagus (CN X) and the spinal accessory (CN XI) nerves. Therefore, isolated syndromes involving the glossopharyngeal nerve are rare. Intra-axial lesions include gliomas, lymphomas, metastases, vascular malformations, infarctions, and inflammatory abnormalities. Multiple sclerosis may also affect the medulla adjacent to the cranial nerve nuclei. Leptomeningeal metastases, granulomatous disease, and even tortuous or aneurysmal dilatation of vessels may affect the nerve as it enters the cistern. Lesions in the region of the posterior skull base and jugular foramen, such as metastases, schwannomas, paragangliomas, and meningiomas, usually also involve the other lower cranial nerves. Tonsillar pain syndromes, palate weakness, and loss of gag reflex accompanied by loss of taste and sensation in the posterior pharynx may signal a glossopharyngeal nerve lesion.

As with the other cranial nerves, MRI of CN IX is the preferred modality for investigating possible lesions such as masses or vascular compression, with CT providing information on the bony integrity of the foramina. Imaging protocols should focus on the posterior skull base and upper neck.

Vocal Cord Paralysis

The vagus nerve (CN X) supplies visceral sensation to the pharynx, larynx, and viscera, and a small twig of general sensation supplies the ear. Branchial motor branches innervate muscles of the pharynx and larynx, whereas visceral motor branches play a predominant role in parasympathetic supply to the thorax and abdomen. The vagus nerve boasts the longest course in the body of any cranial nerve and is therefore vulnerable to a wide range of pathologies occurring throughout its trajectory from the posterior fossa and skull base to the neck, thorax, and abdomen. Intracranial processes such as meningiomas, schwannomas, metastases, granulomatous disease, ischemia, vascular conditions, and infection may affect the vagal nuclei and the nerve as it exits the medulla. Paragangliomas, schwannomas, and metastases involving the skull base may affect the nerve and the neighboring glossopharyngeal nerve (CN IX) by infiltration of fibers or by compression. Within the neck, trauma may also affect the vagus nerve in addition to masses, vascular lesions, thyroid conditions, infection, or inflammation. Viral neuropathy may be one of the most common causes of idiopathic vagal palsies.

One of the most troubling symptoms of vagus dysfunction is vocal cord paralysis. Because lesions anywhere in the long course of the nerve may potentially cause paralysis, the imaging protocol must visualize the full extent of the nerve from the skull base to the mid-chest. With its rapid scanning time and availability, CT provides an excellent means of examining the lower course of the nerve. Moreover, thoracic causes of paralysis, such as lung cancer, tuberculosis, and thoracic aortic aneurysm, are common. Although chest radiographs may detect many of these causes, chest CT is more sensitive especially for lesions concealed in the aortopulmonary window. For imaging of the upper course of the nerve including the skull base, MRI is preferred. For the mid-neck and larynx, CT and MRI complement one another. For example, CT may differentiate traumatic arytenoid dislocation from neurogenic paralysis. Rapid multislice CT scanning, including functional 3D applications, also allows the patient to perform phonation and breathing maneuvers during imaging to augment diagnosis. US may also have a role in imaging of the neck. Although imaging is essential in the evaluation, it only supplements the physical examination and may not detect all lesions. Moreover, PET imaging used for evaluating head and neck malignancy may yield false-positive findings in the larynx for patients with vocal cord paralysis or unrecognized physiological asymmetry.

Weakness or Paralysis of the Sternocleidomastoid and Trapezius Muscles

The spinal accessory nerve (CN XI) supplies the sternocleidomastoid muscle and the upper portion of the trapezius muscle as its sole branchial motor function. Palsy is clinically manifested by weakness and atrophy of these muscles and may be accompanied by evidence of involvement of the glossopharyngeal (CN IX) and vagus (CN X) nerves in combined syndromes. Loss of volume and fatty infiltration of the sternocleidomastoid and trapezius muscles may be noted on imaging. CT and MRI are complementary in diagnosing conditions such as posterior fossa and skull base infarctions, vascular lesions, Chiari malformations, paragangliomas, schwannomas, meningiomas, and metastases, or in recognizing nerve involvement from prior neck surgeries.

Weakness or Paralysis of the Tongue

The hypoglossal nerve (CN XII) supplies somatic motor innervation to the intrinsic and extrinsic muscles of the tongue, except the palatoglossus muscle. Palsy of this nerve is recognized by dysarthria and deviation of the tongue to the affected side on protrusion. Atrophy and fatty infiltration of the tongue may be noted on imaging. Lesions of the posterior fossa, skull base, upper neck, and floor of mouth may affect the hypoglossal nerve. They include infarctions, meningiomas, schwannomas, paragangliomas, carcinomas, metastases, subarachnoid hemorrhage, Chiari malformations, basilar invagination, and fractures. As with the other lower cranial nerves, MRI is the preferred modality for CN XII, and CT provides complementary information on the integrity of the bony structures and foramina.

Combined Cranial Neuropathy Syndromes and Perineural Spread of Tumor

Because of the complex anatomy of the head and neck and the close proximity of several cranial nerves, many clinical presentations of cranial neuropathy involve multiple nerves. As in syndromes of combined neuropathy of the upper cranial nerves, such as those related to vision and the extraocular muscles (which are covered in other Appropriateness Criteria®), syndromes involving the lower cranial nerves are also grouped primarily by the proximity of the involved cranial nerves. For example, Gradenigo's syndrome involves CNs V and VI as they travel in the vicinity of the petrous apex, whereas Vernet's syndrome involves CNs IX, X, and XI as they travel within the jugular foramen. Imaging protocols should be tailored to evaluate the suspected region of anatomy when the syndrome is identified by the clinician.

A difficult problem for the surgeon is the perineural spread of head and neck malignancy. The trigeminal (CN V) and facial (CN VII) are the most common nerves involved; however, any cranial nerve traveling in the vicinity of a malignancy may become involved. MRI has emerged as the preferred imaging method for evaluating perineural spread of tumor, although CT may be very useful for visualizing the neural foramina. PET imaging may also be helpful. Perineural spread of tumor along the facial nerve may evade even the most meticulous imaging. Subtle clues such as nerve enhancement, nerve enlargement, foraminal expansion, or muscle volume loss may indicate cranial nerve involvement with tumor. For example, asymmetry of facial musculature may be useful in detecting perineural tumor spread along the facial nerve or predicting return of function after nerve grafting.

Summary

- Imaging is useful in identifying the primary pathology causing cranial neuropathy, such as mass or inflammation, and is also helpful in noting secondary signs of cranial nerve involvement, such as fatty infiltration or volume loss in denervated muscles.
- MRI is the preferred imaging modality for evaluating the cranial nerves. CT remains a useful complement for visualizing the skull base and neural foramina.
- Imaging protocols must be carefully tailored to reflect the complex anatomy and function of the cranial nerves.
- Effective imaging requires a collegial working alliance between the referring clinician and the imaging specialist.

Anticipated Exceptions

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m^2), and almost never in other patients. There is growing literature regarding NSF. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73m^2. For more information, please see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Abbreviations

- CISS/FIESTA, constructive interference in steady-state/fast imaging employing steady-state acquisition
- CT, computed tomography
- FDG-PET, fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography
- MRI, magnetic resonance imaging
- US, ultrasound

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
	<0.1 mSv	<0.03 mSv
	0.1-1 mSv	0.03-0.3 mSv
	1-10 mSv	0.3-3 mSv
	10-30 mSv	3-10 mSv
	30-100 mSv	10-30 mSv

*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Cranial neuropathy

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Family Practice

Internal Medicine

Neurological Surgery

Neurology

Otolaryngology

Radiology

Intended Users

Health Plans

Hospitals

Managed Care Organizations

Physicians

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of initial radiologic examinations for patients with cranial neuropathy

Target Population

Patients with cranial neuropathy

Interventions and Practices Considered

1. Magnetic resonance imaging (MRI)
    - Head without and with contrast
    - Head without contrast
    - Head and neck without and with contrast
    - Head and neck without contrast
2. Computed tomography (CT)
    - Head with contrast
    - Head without contrast
    - Head without and with contrast
    - Head and neck with contrast
    - Head and neck without contrast
    - Head and neck without and with contrast
    - Chest with contrast
    - Chest without contrast
    - Chest without and with contrast
3. Fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography (FDG-PET)/CT whole body
4. Ultrasound (US) neck
5. X-ray chest

Major Outcomes Considered

Utility of radiologic examinations in differential diagnosis

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Procedure

The Medline literature search is based on keywords provided by the topic author. The two general classes of keywords are those related to the condition (e.g., ankle pain, fever) and those that describe the diagnostic or therapeutic intervention of interest (e.g., mammography, MRI).

The search terms and parameters are manipulated to produce the most relevant, current evidence to address the American College of Radiology

Appropriateness Criteria (ACR AC) topic being reviewed or developed. Combining the clinical conditions and diagnostic modalities or therapeutic procedures narrows the search to be relevant to the topic. Exploding the term "diagnostic imaging" captures relevant results for diagnostic topics.

The following criteria/limits are used in the searches.

1. Articles that have abstracts available and are concerned with humans.
2. Restrict the search to the year prior to the last topic update or in some cases the author of the topic may specify which year range to use in the search. For new topics, the year range is restricted to the last 5 years unless the topic author provides other instructions.
3. May restrict the search to Adults only or Pediatrics only.
4. Articles consisting of only summaries or case reports are often excluded from final results.

The search strategy may be revised to improve the output as needed.

Number of Source Documents

The total number of source documents identified as the result of the literature search is not known.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Strength of Evidence Key

Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.

Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.

Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.

Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author drafts or revises the narrative text summarizing the evidence found in the literature. American College of Radiology (ACR) staff draft an evidence table based on the analysis of the selected literature. These tables rate the strength of the evidence for all articles included in the narrative text.

The expert panel reviews the narrative text, evidence table, and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the table. Each individual panel member forms his/her own opinion based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Modified Delphi Technique

The appropriateness ratings for each of the procedures included in the Appropriateness Criteria topics are determined using a modified Delphi methodology. A series of surveys are conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. American College of Radiology (ACR) staff distributes surveys to the panelists along with the evidence table and narrative. Each panelist interprets the available evidence and rates each procedure. The surveys are completed by panelists without consulting other panelists. The ratings are a scale between 1 and 9, which is further divided into three categories: 1, 2, or 3 is defined as "usually not appropriate"; 4, 5, or 6 is defined as "may be appropriate"; and 7, 8, or 9 is defined as "usually appropriate." Each panel member assigns one rating for each procedure per survey round. The surveys are collected and the results are tabulated, de-identified and redistributed after each round. A maximum of three rounds are conducted. The modified Delphi technique enables each panelist to express individual interpretations of the evidence and his or her expert opinion without excessive bias from fellow panelists in a simple, standardized and economical process.

Consensus among the panel members must be achieved to determine the final rating for each procedure. Consensus is defined as eighty percent (80%) agreement within a rating category. The final rating is determined by the median of all the ratings once consensus has been reached. Up to three ratings rounds are conducted to achieve consensus.

If consensus is not reached, the panel is convened by conference call. The strengths and weaknesses of each imaging procedure that has not reached consensus are discussed and a final rating is proposed. If the panelists on the call agree, the rating is proposed as the panel's consensus. The document is circulated to all the panelists to make the final determination. If consensus cannot be reached on the call or when the document is circulated, "No consensus" appears in the rating column and the reasons for this decision are added to the comment sections.

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current literature and expert panel consensus.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Potential Harms

Positron emission tomography (PET) imaging used for evaluating head and neck malignancy may yield false positive findings in the larynx for patients with vocal cord paralysis or unrecognized physiological asymmetry.

Gadolinium-based Contrast Agents

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m^2), and almost never in other patients. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m^2. For more information, please see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Relative Radiation Level (RRL)

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a RRL indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

The American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report

Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Wippold FJ II, Cornelius RS, Aiken AH, Angtuaco EJ, Berger KL, Brown DC, Davis PC, Holloway K, McConnell CT Jr, Mechtler LL, Nussenbaum B, Rosenow JM, Roth CJ, Seidenwurm DJ, Slavin K, Waxman AD, Expert Panel on Neurologic Imaging. ACR Appropriateness CriteriaÂ® cranial neuropathy. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 18 p. [130 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

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Guideline Developer(s)

American College of Radiology - Medical Specialty Society

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Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Neurologic Imaging

Composition of Group That Authored the Guideline

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Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

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Guideline Availability

Electronic copies: Available from the American College of Radiology (ACR) Web site.

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria®. Evidence table development – diagnostic studies. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 3 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 90 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria® cranial neuropathy. Evidence table. Reston (VA): American College of Radiology; 2012. 32 p. Electronic copies: Available from the ACR Web site.

Patient Resources

None available

NGC Status

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